

Claims

1. A method of remote metering the consumption of utilities distributed through a public distribution network (HV, MV, LV) to a plurality of consumers (H₁, H₂, ..., H_n), each consumer being associated with at least one remote meter (RM), wherein

5 - each of the plurality of remote meters (RM) measures a consumption and reports the measured consumption to a concentrator (C) associated with said plurality of remote meters (RM), and

10 - said concentrator (C) communicates with said plurality of remote meters (RM) in order to collect consumption data and perform tasks related to the administration of its associated remote meters;

15 - each of said remote meters (RM) having a host controller (MCM) and a program memory (PM₁, PM₂), said host controller (MCM) executing programs stored in said program memory (PM₁, PM₂),

20 wherein said concentrator (C) performs the operation of

25 - transmitting program data (SC₅, SC₈) to at least one of said remote meters (RM);

30 wherein at least one of said remote meters (RM) performs the operation of

35 - receiving said program data (SM₄, SM₁₁, SM₁₃); and

- updating (SM19) at least a portion of said programs stored in said program memory (PM2) in accordance with the received program data.

5 2. The method according to claim 1, wherein said operation performed by said concentrator of transmitting program data comprises the steps of

- selecting (SC1) at least one individual meter (RM) or group of meters among said plurality of remote meters by transmitting at least one selection message addressed to said at least one individual meter or group of meters;

10 15 - wherein each of said remote meters performs said operation of receiving said program data and updating said program memory subject to the condition that it has been selected by said concentrator.

20 3. The method according to any one of the preceding claims, wherein

- said operation of transmitting program data comprises the step (SC2) of transmitting a program update control message; and
- said operation of updating said program stored in said program memory in accordance with the received program data is performed in accordance with said received program update control message (SC2).

25 30 35 4. The method according to claim 3, wherein said program update control message comprises control information relating to the update time and/or a program digest and/or a download start command.

5. The method according to any one of the preceding claims, wherein said operation of transmitting said program data comprises

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- successively transmitting (SC5) program data messages each comprising a portion of said program data, each transmitted program data message containing a message identifier which distinguishes the message from other program data messages.

10 6. The method according to claim 5, wherein

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- the concentrator transmits (SC5) to said at least one remote meter (RM) a message indicating a number N of program data messages;

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wherein the operation of receiving said program data comprises the steps of

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- checking (SM5) whether all the N program data messages have been received successfully; and
- if all the N program data messages have been received successfully, arranging (SM19) the program data content of said N messages in accordance with the respective identifiers n of each message and/or calculating a program digest from the received program data messages.

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7. The method according to claim 5 or 6, wherein said concentrator

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- successively queries (SC7) each of said at least one meters whether it has received all program

data messages comprising different portions of said program data; and

- if a queried meter reports missing or incorrectly received program data messages, retransmits (S8) in broadcast mode the program data messages reported by the queried meter to be incorrect or missing;
- wherein each of said at least one meters receives (SM11 to SM15) those program data messages during said retransmission which the respective meter has missing or incorrectly received.

15 8. The method according to claim 7, comprising

- said concentrator repeating (SC9) said operation of successively querying each of said at least one meters until all of said at least one meters have reported the successful reception of all program data messages into which the program data are divided, or until an abort condition is satisfied.

25 9. The method according to claim 8, comprising

- if a meter has successfully received all of said program data messages, reporting (SM10) a download complete message to said concentrator;
- said concentrator excluding (SC11) from said successive queries such meters from which a download complete message has been received.

35 10. The method according to claim 9, wherein said download complete message is reported in response to a said query by said concentrator.

11. The method according to any one of the preceding
claims, wherein said step of receiving program data
comprises storing (SM13) said program data in a buffer
5 memory.

12. The method according to claim 11, wherein said buffer
memory is a non volatile memory (PM3).

10 13. The method according to claim 11 or 12, wherein the
operation of updating said program stored in said
program memory comprises

15 - checking (SM6, SM7) whether the program data
stored in said buffer memory are correct;

20 - if the program data in said buffer memory are
correct, copying (SM19) the program data stored
in said buffer memory (PM3) into said program
memory (PM2);

25 - checking (SM20) whether the copied data in said
program memory are correct; and

30 - if the copied data are found to be not correct,
repeating (SM19, SM20) the step of copying the
program data stored in said buffer memory into
said program memory.

35 14. The method according to any one of the claims 11 to
13, wherein said operation of updating at least a
portion of said programs stored in said program memory
(PM2) is performed by said host controller (MCM)
executing a program data swap routine stored in a non
volatile memory area (PM1) protected against any
program data change.

15. The method according to claim 13 or 14, comprising
- setting (SM17) a flag prior to copying data from said buffer memory into said program memory (PM2); and
 - clearing (SM22) said flag if the copied data in said program memory (PM2) are found to be correct.
- 10 16. The method according to any one of the claims 13 to 15, wherein said host controller
- checks (SM23) said flag after a power failure; and
 - if said flag is found to be set, restarts (SM24) the operation of copying data from said buffer memory (PM3) into said program memory (PM2) and checking (SM25) the correctness of the copied data.
- 15 17. The method according to any one of the preceding claims, wherein said concentrator (C) communicates with said remote meters (RM) via power line communication.
- 20 18. The method according to any one of the preceding claims, wherein said utilities are electricity, water or gas.
- 25 19. A system for remote metering the consumption of utilities distributed through a public distribution network (HV, MV, LV) to a plurality of consumers (H₁, H₂, ..., H_n), the system comprising

- at least one concentrator (C) and a plurality of remote meters (RM) located inside or outside of customer premises,

5 - said at least one concentrator (C) being adapted to communicate with said remote meters (RM) in order to collect consumption data and perform tasks related to the administration of its associated remote meters (RM);

10 - each of said remote meters (RM) having a host controller (MCM) and a program memory (PM1, PM2) for executing programs stored in said program memory;

15 - said concentrator (C) and said remote meters (RM) being adapted to perform a method of remote metering in accordance with any one of the preceding claims.

20. A concentrator for collecting data regarding the consumption of utilities from a plurality of associated remote meters (RM) each having a host controller (MCM) and a program memory (PM1, PM2) for storing a program to be executed by said host controller (MCM) of the remote meter (RM), said concentrator (C) comprising

25 - a communication interface (CIC) for communicating with said plurality of remote meters (RM);

30 - a micro controller (MCC) for processing data received from said remote meters (RM) through said communication interface (CIC);

35 - said micro controller (MCC) being programmed to transmit program data to at least one of said

associated remote meters (RM) for updating at least a portion (PM2) of said programs stored in the program memory (PM1, PM2) of said remote meter (RM).

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21. A remote meter for measuring the consumption of utilities, comprising

- a communication interface (CIM) for transmitting data concerning the measured consumption of utilities to a concentrator (C);
- a host controller (MCM) and a program memory (PM1, PM2), said host controller being arranged to execute programs stored in said program memory relating to the measuring of the consumption of said utilities and the administration of the remote meter (RM);
- wherein said remote meter (RM) is adapted to receive program data from said concentrator (C) through said communication interface (CIM), and to update at least a portion (PM2) of said programs stored in said program memory in accordance with said received program data.